PATENT SPECIFICATION
DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Drill Assembly

I, JEROME LABROSSE, a Canadian citizen of St. Jerome, Quebec, Canada, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to drill assemblies.

In various types of drilling operations, and especially in those in which a casing is employed as in well drilling, reaming, piling, and the like, it is common practice to provide means whereby the cutters may be radially retracted to permit withdrawal of the assembly through the casing. Such means frequently comprises a costly and complicated structure which is difficult to maintain in effective operation because of the presence of actuating devices, such as springs, which are subject to failure.

It is an object of this invention to provide a drill assembly of the cutter retractable type which is simple in structure, which is rugged in construction, which possesses a reduced number of moving parts, which has no parts subject to undue operating stresses, which is of increased effectiveness in operation, and which is subject to low maintenance cost.

The invention will be described with reference to the accompanying drawings, in which

Figure 1 is a sectonal side elevation of a drill bit assembly in accordance with the invention,

Figure 2 is another side elevation of the bit assembly shown in Figure 1, and

Figure 3 is a bottom plan view.

Referring to the drawing, 37 is a substantially cylindrical member arranged for screw-threaded or like connection to a drill rod connector 38.

Member 37 has a plurality (two as shown) of symmetrically arranged grooves or recesses 39 in its exterior wall surface, each such recess extending longitudinally from the lower end of the member and terminating in an arcuate shoulder 40. Preferably, shoulder 40 is disposed at an acute angle to the axis of the member. Each recess 39 has a bottom wall 41 which is inwardly tapered from shoulder 40 to provide a recess of gradually increasing depth from the upper to the lower portion thereof. Preferably, also, each recess 39 is undercut whereby its side walls 42 flare outwardly from the mouth thereof.

A cutter 43 is adapted to be seated in each recess 39, such cutter having outwardly flared side walls 44 for engagement with the side walls 42 of the recess, an inner wall 45 for engagement with wall 41 of the recess, an end wall 46 for engagement with shoulder 40 of the recess, and an outer wall 47. In the fully seated position of the cutter, wall 47 is disposed approximately in the plane of the exterior surface of member 37. Inner wall 45 is tapered to conform with the tapered bottom wall 41 of the recess. Cutter 43 terminates at its lower end in a cutting edge portion 48 which projects radially outwardly from wall 47 and a radially extending cutting edge 49 on such portion 48. The cutting edge portion 48 has an upper shoulder 48a radially outwardly extending from wall 47. Cutter 43 has a length considerably shorter than that of groove 39 whereby in its seated position with end wall 46 in engagement with shoulder 40, the cutting edge 49 is disposed above the lower mouth 39a of the groove 39.

Means for limiting downward movement of each cutter out of the recess 39 comprises a pin 50 having an end portion seated in a socket 51 in member 37 and another end portion disposed in a longitudinal groove 52 in the inner surface 45 of the cutter. It will be observed that, in the fully seated position of the cutter, the pin is in substantial

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engagement with a shoulder 53 defining the lower end of the groove but that on downward movement of the cutter, the pin will engage a shoulder 54 defining the upper end of the groove and thus prevent further downward movement.

The lower end of the member 37 is provided with a diametral cutting edge 55 disposed at an angle (a right angle, as shown) to the cutting edges 49.

Means for directing a stream of air or water to the cutting end of the assembly comprises an axial bore 56 in member 37 and a cylindrical valve body 57 seated on an annular shoulder 58 in such bore. The body 57 has an axial passage 59 controlled by a valve member 60 fixed to the upper end of a tube 61 and normally held in position closing an axial bore 62 in connector 38 by a spring 63 engaging a shoulder 64 on member 60 and a shoulder 65 on body 57. The member 60 has passages 66 leading from its upper end to the interior of tube 61 which communicates with passage 59. The lower end of passage 59 communicates with the end of the bit assembly through passages 67. It will be apparent, that, in response to pressure on valve member 60 sufficient to overcome the force of spring, fluid may enter the space in bore 56 above valve member 60 and thence flow through passages 66, tube 61, passage 59, and passages 67.

In operation, with the parts assembled as shown, drilling may be accomplished in normal manner, the impact forces supplied to cutters 43 being well distributed in the assembly by reason of the engagement of walls 46 thereof with shoulders 40 of the recesses 39.

On raising movement of the assembly and engagement of the shoulders 48a with an obstruction such as the end of a casing, the cutters 43 will move downwardly in the recesses 39 until further downward movement is arrested by engagement of the pins 50 with the shoulders 54 of the grooves 52. However, because of the tapered surfaces of walls 41 of the recesses 39 and walls 45 of the cutters, such movement will result in radial inward movement of the cutters to the position shown in dotted lines in Fig. 1 wherein the cutting edge portions 48 are disposed within a circumference the diameter of which is no greater than the exterior diameter of cylindrical member 37. Thus, the drill assembly may now be withdrawn through the casing or the like.

WHAT I CLAIM IS:—

1. A drill bit assembly comprising a substantially cylindrical member having an upper section, drill rod connection means on said upper section, and a lower section, said lower end section having a plurality of longitudinally extending external surface areas, said surface areas being in converging relation to each other and terminating at the end of said lower section, and a plurality of separate cutters each having an inclined surface in engagement with one of said surface areas, said member having a shoulder defining the upper end of each said surface area, each said cutter having an upper end surface engageable with one of said shoulders to limit upward movement of said cutter with respect to said member, each said cutter being slidably downwardly along said surface area and away from said shoulder to move said cutter radially inwardly.

2. A drill bit assembly comprising a substantially cylindrical member, having an upper section, drill rod connection means on said upper section, and a lower section, said lower section having a plurality of longitudinally extending external surface areas, said surface areas being in converging relation to each other and terminating at the end of said lower section, and a plurality of separate cutters each having an inclined surface in engagement with one of said surface areas, said member having a shoulder defining the upper end of each said surface area, each said cutter having an upper end surface engageable with one of said shoulders to limit upward movement of said cutter with respect to said member, each said cutter having a radially extending cutting edge projecting beyond the external surface of said member in the shoulder-engaged position of said cutter, each said cutter being slidable downwardly along said surface area and away from said shoulder to move said cutter radially inwardly and dispose said cutting edge radially inwardly of said external surface of said member

3. A drill bit assembly as defined in claim 2, including means limiting said downward sliding movement of said cutters.

4. A drill bit assembly comprising a substantially cylindrical member having an upper end and a lower end, and a plurality of longitudinally extending grooves each extending from said lower end, each said groove having a bottom surface, said bottom surfaces being mutually converging towards said lower end, and a cutter slidably seated in each said groove, said cutter having an inclined face engaging said bottom surface, each said groove having an upper end wall defining the upper terminal of said groove, said cutter having an end surface engageable with said groove end wall to limit upward movement of said cutter, said cutter having a radially extending cutting edge projecting outwardly beyond said member when said cutter end surface is in engagement with said groove end wall, said cutter being slidable downwardly in said groove to move said cutting edge inwardly of said member.

5. A drill bit assembly as defined in claim 4, including means limiting downward movement of said cutter comprising a pin carried

by said member and projecting radially outwardly of said bottom surface of each said groove, said cutter having a longitudinally extending groove therein receiving the projecting portion of said pin, said last-mentioned groove having end walls engageable by said pin.

6. A drill bit assembly as defined in claim 4, each said groove having undercut side walls, each said cutter having flaring side walls in engagement with said undercut side walls of said groove.

7. A drill bit assembly substantially as hereinbefore described with reference to and as shown by the accompanying drawings.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale

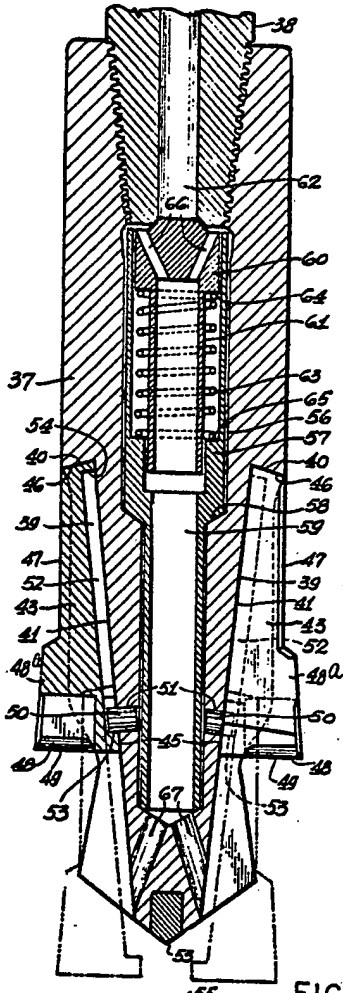

FIG. 1

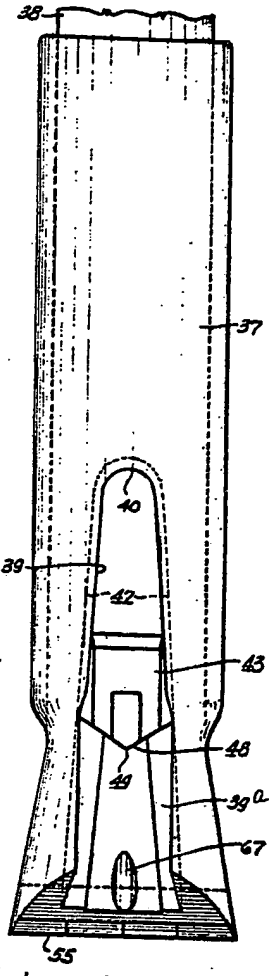

FIG. 2

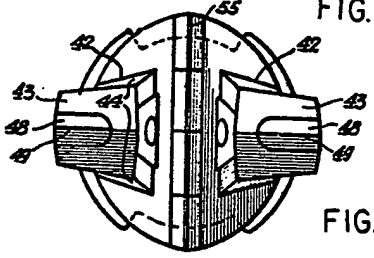

FIG. 3